ENVIRONMENTAL SCIENCE AND TECHNOLOGY DIVISION
ACCOMPLISHMENTS FOR FY1997

Technical Accomplishments

*** Life-Cycle Testing Completed With Industrial CRADA Participants**
FETC has concluded parametric testing with the Moving-Bed Copper Oxide Process -- a dry, regenerable sorbent flue gas cleanup process. Sargent and Lundy Engineers, Thermo Power Corporation, and Foster Wheeler Development Corporation entered into a CRADA with FETC and have collaborated with FETC pertaining to the development of the Moving-Bed Copper Oxide Process. Four interim reports have summarized the experimental information from pilot-scale absorption and regeneration studies performed with the life-cycle test system at Pittsburgh.

*** Catalytic Process for Elemental Sulfur Production Investigated**
FETC and its CRADA partner, Sorbent Technologies Corporation (Sorbtech), have performed testing of Sorbtech's process on the life-cycle test system (LCTS) at Pittsburgh. Sorbtech's process catalytically converts sulfurous compounds (e.g., SO_2) within a gas stream directly to elemental sulfur. An experimental skid, designed and constructed by Sorbtech at its Ohio site, was affixed to the regenerator stream of the LCTS, that tested the Moving-Bed Copper Oxide Process. A series of tests were conducted with the LCTS at a desired regenerator gas composition. Data that was obtained at the end of September are being reduced, but preliminary results indicate that high sulfur yields from the catalytic process were obtained.

*** Collaborative Effort for Determination of Mercury Species**
A joint venture in the air toxics area has occurred among FETC, ATS Inc., and ADA Technologies, Inc. ATS has investigated various standard and modified manual sampling techniques for air toxics and mercury speciation on the 500-lb/hr unit while FETC has provided combustion of various coals that have been used in other mercury studies. Concurrently, a prototype continuous emissions monitor for mercury speciation constructed by ADA has been operated and shaken down during the testing. Ultimately, the information has provided FETC with more baseline information pertaining to air toxics emissions on the 500-lb/hr unit.

*** Acid Plant Scrubber Water Treatment using Bacterial Sulfate Reduction** Facing its most difficult challenge to date, bacterial sulfate reduction treatment has been successfully applied to acid plant scrubber (APS) water from copper and lead smelting. Typical APS water is pH 1-2 and contains dissolved SO_2, SO_4^{2-}, As, Cd, Pb, Zn, Sb, Se, Tl, and Hg. Due to the highly toxic nature of the water's components, the treatment of this water is critical, and is carefully monitored by regulatory agencies. Until now, no single water treatment technology has been capable of treating this water to meet discharge standards. The treatment that is currently recognized by EPA involves chemical oxidation with hydrogen peroxide, ferric chloride addition, and metal hydroxide precipitation using lime. Sulfide treatment is then used to polish the effluent before discharge. The cost of the multiple technologies that are needed to treat APS water can total more than $13 per 1000 gallons of water treated, not including sludge disposal costs. Pilot-scale tests performed by the Department of Energy have shown that bacterial sulfate reduction treatment can treat APS water to drinking water standards for about 60% of the cost of the EPA-approved treatment. Moreover, the sludge produced by bacterial sulfate reduction treatment is of lesser volume and should be less

susceptible to resolubilization (TCLP tests are currently underway). Savings in sludge disposal costs are expected to be significant.

Patents

Acid Mine Water Aeration and Treatment System, U.S. Patent Number - 4,695,378, September 22, 1987. License renewed in September 1995.

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